1. Formally adopt a mission profile of a medium-sized mission every 1.5 years and an ESSP every 4 years, instead of presenting three possible mission profiles without expressing preference (pages 37-38). The rationale for our preference is presented in our report from the May 2006 meeting. We recommend that the mission profile featured in Figure 4.3 be adopted as the ESD plan, with one possible modification for the 2014 mission (see comment 2 below).

2. Consider the trade-off of having a medium-sized mission vs. an ESSP as the first open mission beyond 2012. Figure 4.3 presently shows an open ESSP mission in 2014 and the first open medium-sized mission in 2016. Could the order of the two missions be reversed? As we discussed in our May report, medium-sized missions provide in general the best strategic investment for NASA and the best scientific investment for the community. At the same time, we are sensitive about the budget-driven delays that may result from having a medium-sized mission first.

3. Be more consistent in the definition of the top-priority atmospheric composition mission. The listing in Table 2.2.a ("multispectral atmospheric composition") is too general. The listing in Table 4.3 prioritizes a GEO or L1 mission, but the subsequent text (page 43) prioritizes a LEO mission. Recent community input for air quality through the Air Quality Research from Space Workshop (Feb 06) and the NRC Decadal Survey (health, chemical weather) stresses the need for measurements with high temporal resolution; it identifies a GEO multi-spectral mission as top priority for air quality, with L1 and MEO multi-spectral missions as top-priority cross-cutting missions (i.e., of benefit extending beyond air quality). From NASA's perspective, an L1 platform would be attractive for addressing global atmospheric composition objectives encompassing air quality, climate forcing, stratospheric ozone, and Sun-Earth connections, and linking also to other Earth Science objectives. We recommend that a. "sentinel multi-spectral mission (GEO or L1)" be consistently listed as the top-priority atmospheric composition mission and that the text on page 43 be rewritten to reflect this.

4. Better state the importance of cross-cutting and complementary technologies and platforms in guiding the prioritization of future missions. It will likely be advantageous to reconfigure the high-priority focus area missions presently listed in the Plan in ways that cut across focus areas. Such reconfiguration needs not be attempted now but its potential value should be recognized. For example, an InSAR mission would complement passive technologies already in space and serve high-priority mission needs of the solid earth, ecosystems, and ocean communities.

5. Flesh out section 4.5 on "Earth Science beyond 2016" (presently blank). Major themes could include:

    a. Observation and prediction of the rapid environmental change that we fully expect to be taking place at that time;

b. New observation capabilities and vantage points enabled by technology developments (e.g., microsatellites);

c. Development of Earth System Models accounting for the coupling between the different surface reservoirs of the Earth and leveraging on the NASA observational capabilities across the breadth of Earth Science disciplines.

6. Better articulate the objectives of the airborne science program and the input of the scientific community towards guiding these objectives. The section describing that program (section 4.4.6) is very generic. In particular, it is not clear from that section what specific scientific purposes the UAVs are intended to serve. Development of new technologies is important but should be guided by scientific and satellite validation needs. The subcommittee views the suborbital program as a crucial element of the ESD portfolio and would like to see its role described in more detail. One way to do this would be to integrate the role of suborbital observations into section 4.2, "Science Objectives and Outcomes".

7. Better articulate the interaction between satellite observations and high-end models including Earth System Models (ESMs). Section 4.4.4 presently describes models as assimilators of satellite observations, but it is also important for optimizing scientific return to design satellite missions such that they serve the needs of the models. Identifying priorities for future satellite missions should be a major motivation for the modeling activities at NASA, and this could receive more play in section 4.2.

8. Refer to the legacy ESE roadmaps in section 4.2 but move these roadmaps (including the carbon cycle and ecosystems roadmap, Figure 4.1) to an appendix where they can be described in caption as "legacy roadmaps". These roadmaps are important for illustrating the history of ESD strategy and the community input feeding into this strategy. However, they are dated, the timing of the missions indicated on the roadmaps is obsolete, and the priorities may have evolved. Having them in the main text may lead to confusion. New roadmaps for each focus area, and a collective ESD roadmap across focus areas, should be constructed in 2007 following the Decadal Survey input.

We hope that the NAC and the SMD will find our comments helpful and we are at your disposal for further information.

Sincerely,

The Earth Science Subcommittee